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(54) PLANARIZATION OF SUBSTRATES USING ELECTROCHEMICAL MECHANICAL POLISHING

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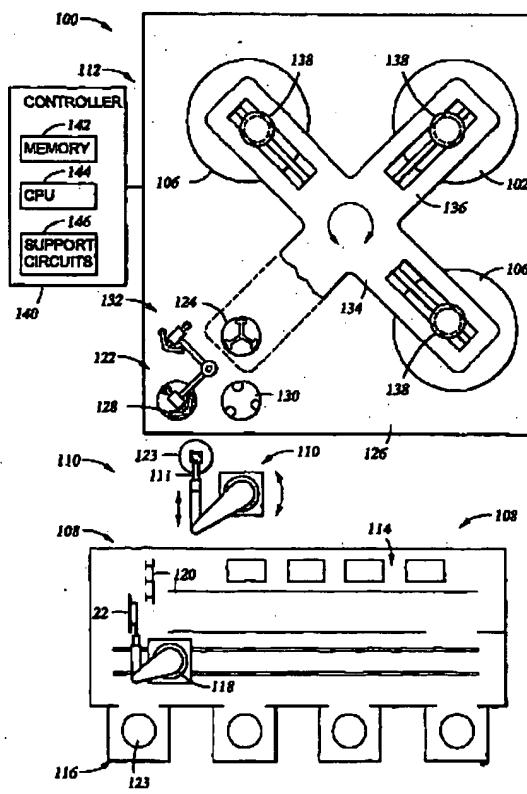
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(54) Title: PLANARIZATION OF SUBSTRATES USING ELECTROCHEMICAL MECHANICAL POLISHING



(57) Abstract: A method and apparatus are provided for planarizing a material layer on a substrate. In one aspect, a method is provided for processing a substrate including forming a passivation layer on a substrate surface, polishing the substrate in an electrolyte solution, applying an anodic bias to the substrate surface, and removing material from at least a portion of the substrate surface. In another aspect, an apparatus is provided which includes a partial enclosure, polishing article, a cathode, a power source, a substrate carrier movably disposed above the polishing article, and a computer based controller to position a substrate in an electrolyte solution to form a passivation layer on a substrate surface, to polish the substrate in the electrolyte solution with the polishing article, and to apply an anodic bias to the substrate surface or polishing article to remove material from at least a portion of the substrate surface.

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A. CLASSIFICATION OF SUBJECT MATTER
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B. FIELDS SEARCHED

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Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

INSPEC, EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 807 165 A (HARPER JAMES MCKELL EDWIN ET AL) 15 September 1998 (1998-09-15) column 4, line 55 – line 60	1-3
X	WO 00 26443 A (NUTOOL INC) 11 May 2000 (2000-05-11) the whole document	25, 35
X	SU 1 618 538 A (RREDERRIYIATIE R YIA A 1067) 7 January 1991 (1991-01-07) the whole document	25
A	EP 0 846 742 A (CABOT CORP) 10 June 1998 (1998-06-10) the whole document	---

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Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 99 65072 A1 (SPEEDFAM IPEC CORP) 16 December 1999 (1999-12-16) the whole document	

INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US 5807165	A	15-09-1998	NONE		
WO 0026443	A	11-05-2000	US 6176992 B1 AU 1461700 A CN 1329681 T EP 1129237 A2 JP 2002528649 T WO 0026443 A2 US 2001042690 A1 US 2002153256 A1 US 2003006147 A1 US 6409904 B1	23-01-2001 22-05-2000 02-01-2002 05-09-2001 03-09-2002 11-05-2000 22-11-2001 24-10-2002 09-01-2003 25-06-2002	
SU 1618538	A	07-01-1991	SU 1618538 A1		07-01-1991
EP 0846742	A	10-06-1998	US 5954997 A US 6126853 A US 6309560 B1 AU 5373998 A EP 0846742 A2 JP 11021546 A KR 2000057476 A TW 419714 B WO 9826025 A1 US 2002145127 A1 US 2002033382 A1 US 6362106 B1	21-09-1999 03-10-2000 30-10-2001 03-07-1998 10-06-1998 26-01-1999 15-09-2000 21-01-2001 18-06-1998 10-10-2002 21-03-2002 26-03-2002	
WO 9965072	A	16-12-1999	US 6121152 A TW 425665 B WO 9965072 A1	19-09-2000 11-03-2001 16-12-1999	

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